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Special Section on Fusion Laser Engineering

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The National Ignition Facility (NIF) now under construction at Lawrence Livermore National Laboratory contains a large frequency-tripled neodymium glass laser system designed to deliver approximately 2 megajoules of ultraviolet laser light in nanosecond pulses to targets for the study of high-energy-density physics and inertial confinement fusion. When all 192 laser beams are operational in 2008 it will dwarf any currently-operating laser system, and even with only four beams now operating it is among the largest and most energetic of such systems. This special section is a collection of papers covering important issues in the optical engineering of large lasers such as NIF. A number of other papers on NIF engineering issues can be found in the *Proceedings of SPIE*, volume 5341.

The first paper by Miller, Moses, and Wuest is an overview of the NIF project and the applications for which the facility was designed. The following papers discuss specific issues in greater depth. Spaeth, *et al.*, discuss the NIF laser architecture, the effect of optical performance specifications on the focal spot size, and some aspects of cleanliness in large laser systems. Bonnano discusses the strategy for assembling NIF from “line-replaceable units” (LRU) that are assembled in a cleanroom and transported to the laser system in sealed containers that mate with the laser enclosures and allow clean installations without maintaining cleanroom standards throughout the facility. Zacharias, *et al.*, discuss the alignment and wavefront control systems that allow beams to strike the target within ±50 microns after a beam path of about 350 meters. Shaw, *et al.*, discuss a laser performance operations model that is used to set up the laser for a shot, and compare the predictions of the model to data from the first four operating beams. Ermolaeva, *et al.*discuss the design and performance of a custom optical fiber that was developed for use in NIF ultraviolet diagnostics. Finally, Honig discusses what has been learned about cleanliness issues in large lasers from past operating systems, and how their cleanliness compares to NIF using the new assembly strategies and techniques.